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FORMER NEBRASKA ORDNANCE PLANT
RAB MEETING 4-23-06
QUESTIONS AND ANSWERS

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32/15	Mike Ryan	Mike Ryan, I'm from Omaha. Why would the MUD model for their well field be any better than, say, a weather service model predicting the weather? What -- what would make MUD's model more accurate? Let's assume it's more accurate, why would it be more accurate than a weather service model?	Greg Steele	Those are like comparing apples and oranges; you're using a -- two totally different models. You're using a groundwater flow model and you're using a weather model.	
33/1	Mike Ryan	But we all know how inaccurate weather service models tend to be. I mean, it's better to use them than what we had, say, 30 or 40 years ago, but we still know they're inaccurate. What -- you know, why wouldn't a groundwater model be just as inaccurate? You've got different variables, granted, but you still got variables and, you know, my thought is that the variables in a weather model are probably more bservable than variables in a groundwater model.	Greg Steele	I'm not going to comment directly on the MUD model. I do not know enough information on the MUD models. What I will say is that the groundwater models in general, they're only as good as the information that you put into them. That includes our Elkhorn model, our Loop model, our Cozad model, that includes the Virginia model. So it really depends on how you discretize the -- how small you make your cells, how accurate you make them, and it all has to do with the groundwater flow equations of -- and keep in mind, the groundwater does not change nearly as fast as what the air does. The mediums are totally different. The groundwater, the temperature stays relatively the same, the air temperature does not, the groundwater temperature stays relatively the same.	
34/6	Mike Ryan	Yeah, but your flows change, you know, they're affected by weather, as you said,	Greg Steele	Well, again, I can't – I can't comment on that. All I can say is that groundwater model in	

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		and you try and take that into consideration, and your seasons change and you have more evaporation at sometimes. I mean, you've still got variables. It just seems like a model is a little better than an educated guess, and you can't say, you know, with a great deal of certainty, you know, what's going to happen. You can't say that these gargantuan wells that MUD is going to put in are not going to affect the Mead site or the contaminants coming from the Mead site. I don't think they can say that until they flip the switch down there.		general, if it's -- if it's designed properly, it is designed for the specific purposes, and each of them, they have their own purpose from which the designer has made it, and they can answer a lot of questions. They can't necessarily answer every question and they don't necessarily coincide with every question being answered that comes up in the future. You may have to collect more data and adjust the model as you see -- as you see fit.	
35/8	Mike Ryan	Now, you said you can't comment on the MUD model because you haven't analyzed it yet. Has USGS been paid by MUD at any point in time to do any analysis of their work product or models that were done for MUD or by MUD?	Greg Steele	No, absolutely --	***Rick Wilson***: Well, Greg, we have done water quality sampling on their wells, but we have not looked at any model. ***Greg Steele***: Not water, no, not modeling, and that's what he asked.
35/19	Mike Ryan	You've done sampling?	Greg Steele	We have done -- we have done sampling, but we do sampling for other folks too.	
35/22	Mike Ryan	But you've done it for MUD?	Greg Steele	We've done it for NRDs, we've done it for the -- many NRDs, many entities. As I mentioned when I -- when I started off my presentation, that we're a nonbias organization. We collect	

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				the data, we give it to the people that need it, and then we have a set protocol that is the same throughout the United States.	
36/5	Mike Ryan	What kind of sampling -- I'm just curious, what kind of sampling?	Rick Wilson	Rick Wilson, I'm with the USGS. If you go to their web site and go to new West Platte Valley neighborhood, you can go there and you can see all the analytical results from the three periods of sampling that we would have conducted for MUD. And you can see all the different compounds that we have looked for; primarily RDX and also some of the organic solvents, and you'll see that listing and the results that we found, and we didn't find any, but they're always listed on their web site.	
37/3	Lynn Moorer	Mr. Steele, do you have a contractual relationship with the Kansas City Corps of Engineers or any district of the Army Corps of Engineers; that is, the USGS?	Greg Steele	Well, you asked if we have a contract. We run surface water gauges.	***Rick Wilson*** (37/22): As a government agency, we do not contract the interagency agreements, and we do with Kansas City Corps of Engineers, the Omaha Corps of engineers and many of the state and local agencies as we pointed out; so we don't contract, we're a government agency, but we do have agreements.

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38/4	Lynn Moorer	All right. So do you have -- does the USGS have an interlocal agreement with the Kansas City District of the Army Corps of Engineers?	Rick Wilson	We have several.	
38/9	Lynn Moorer	And the subjects or general work or the agreement covers what just generally; what do you do for them?	Rick Wilson	The majority of the work that we've done for the Kansas City District has been stream gauging, water measurements in the streams and rivers in the state of Nebraska. We have done some other investigative studies, primarily geophysical investigations where we do subsurface investigations with remote sensing tools, so those are the two primary types of agreements that we have with the Kansas City Corps of Engineers.	
38/22	Lynn Moorer	So it'd be fair to say you don't have an agreement of any kind with the Kansas City Corps of Engineers with respect to modeling?	Rick Wilson	None	
39/2	Lynn Moorer	Therefore, what Mr. Steele is saying this evening is simply USGS's view, but it is not speaking for the Kansas City Corps?	Greg Steele	Absolutely.	
39/6	Lynn Moorer	All right. So we still do not know the Kansas City Corps' views on these models yet; we have the USGS's views, but they don't have a relationship in which they are speaking on behalf of the district, correct?	Garth Anderson	Yeah, this is Garth Anderson, that's exactly the reason we brought them in here tonight because they are a neutral with respect to the groundwater modeling at the site, and they're international experts on groundwater modeling, so no better authority to talk general concepts than USGS.	
40/9	Wanda Blasnitz	I had three questions. One may be a little bit related to what the gentleman was asking about accuracy because you mentioned that there's uncertainties, and I understand that, you know, you have to	Greg Steele	Yes, I've looked at some models that are better than other ones. For instance, we've done -- done one in -- we, the USGS, did one in California, and it was in the San Joaquin Valley, and it matched up very well with the	

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		make an estimate and then as you get data you put back into the model, and you keep building a better model if that's the correct way to explain it. What I guess I was wondering with your experience of having done this, once you've used the model and then you've seen what happens in reality, so there would be some way to tell how accurate maybe a model was for the way it predicted something, have you found that there's some models -- and I don't know whether when I say model I mean software, some kind of model that is better than another one?		predicted heads as -- And one of the things that you can do is if you have a recorder well or as some would say, a long-term observations of the water levels over an aerial extent so that you have many, many points to match the model to, and if you can get the model to match those, then you -- it is a good fit, and if you can get the water balance to match. So it's just not a matter of matching heads; it's a matter of matching the water balance, so the heads, the discharge and stuff, so there are very good models out there.	
41/19	Wanda Blasnitz	With those models, I mean can you give it a percent accuracy like the one that you described in California?	Greg Steele	No, I couldn't give a percent accuracy.	
41/24	Wanda Blasnitz	And I appreciated your explaining how the models work, and I was just curious, you know, when you had the pyramid up there, is the Corps' model that they use for this site numerical, analytical, or where did it fall on there if somebody -- I know you --	Greg Steele	I don't know All of them fell within the groundwater modeling except for the analytical equation, and that would -- and that would semifall within here, but the analytical model and the groundwater flow model, the numerical model, they all fall within here.	
42/15	Wanda Blasnitz	Is the Army's model numerical or analytical?	Jason Leibbert	Our model is numerical and we use the USGS mod flow code to do the modeling.	
42/21	Wanda Blasnitz	And when was the last time the Corps' model was updated to include new data, actual data?	Garth Anderson	We're going to be covering that in just a few minutes, so if you can hold tight we'll get right to that.	
56/17	Lynn Moorer	I have a question on something you just had on your previous slide. I'm looking at your statement here that's saying that the Kansas City District has used the best	Jason Leibbert	Well, do you have our response to that comment with you? We'll get to that, there's slides about the	***Leibbert*** (63/15). So with conductivity, the bottom line simple answer is yes, the

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		available information to estimate both of these factors, and I want to ask about hydraulic conductivity. Have you addressed all the concerns and criticisms raised by Dr. Brian Zurbuchen of DEQ in his April 13, 2004 letter? Just as a brief background to ask – to let you know what I'm talking about, he noted that the hydraulic conductivity assigned in RDGM 4 does not accurately reflect the conditions at the site; and therefore the model predictions of contaminant transport are not reliable. Among the various things that he noted is that the authors of RDGM 4 have offered conflicting conceptual models of the Todd Volley Aquifer beneath the Mead NOP site. And he stated, DEQ believes there's overwhelming evidence that the upper zone of the aquifer is less conductive than the lower zone, and these two units must be assigned unique values of hydraulic conductivity in order to achieve the most reliable contaminant transport predictions. So he specifically said, please, assign representative and distinct hydraulic conductivity values to the upper fine sand unit and the lower sand and gravel unit. So the first question is: Has this been done? Have you done this in updating your RDGM 4?		regulator's comments, actually it may even be in the next couple of ones. Let's just wrap up Saunders County, and we'll go to the regulator's comments in just a minute.	RDGM will be revised to account for different hydraulic conductivities.
65/1	Lynn Moorer	Mr. Leibbert, could you just clarify for me and for the lady who also asked a similar question, when was your last update of your site model? Is that the RDGM 4, is	Jason Leibbert	The RDGM 4 report was published in 2004. Between 2004 and 2005 we started the design effort for the new extraction system to go down here. To help us with that design effort,	

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		that the last run of it … that you would consider a full model or what is your last published site model?		we took the RDGM 4 model, we added some more information into it, we used it very much focused on what was going on down here. We were -- in 2005 we really weren't looking at other things. We were really focused down here on the Load Line 1, so we made modifications to RDGM 4 to help us with this design, and those modifications and those conclusions and results of all that are published in the Load Line 1 design documents. And now in 2006, now we're going to go back and take a whole new look at the whole system. You know, last year in 2005 we were really working down here, now this year is when we expand the model size to include an area that's even larger than this, and that'll be the next update that's coming later this year.	
66/7	Lynn Moorer	In this 2005 update that you did, did you address and carry out all the directives that Dr. Zurbuchen issued in April of 2004, and that Mr. Marquess issued on behalf of EPA in 2004?	Jason Leibbert	Yes	
6613	Moorer	You did -- you carried out all of their instructions or requests?	Leibbert	No, not every single one. We used the ones that made the most sense to help us do this job down here. About half the comments we have incorporated already into the RDGM model, about the other half of the comments are things that will be incorporated this year because they didn't help us with Loan Load 1 design or we didn't have enough new information to satisfy that comment. Again, those are things that we're going to do this year. We've got all those comments. I still I	

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				don't believe that you really don't have all the responses, but we did respond to every single one of those comments.	
67/17	Moorer	Since you have told us that you use your site model to manage the site and for decision making, will a completely updated site- model be developed that addresses all the comments and directives from the regulators before the Corps installs the 100 monitoring wells on the eastern and southern portions on the site?	Leibbert	Yes, we will have a new model that addresses all those old comments from EPA and NDEQ. Will it be done before the 100 new monitoring wells go in, no, probably not. It's -- they're really two independent efforts; they're not hinged on each area. We can make improvements on the RDGM model, we can address all the comments from EPA and DEQ, and we can install the new monitoring wells independently; they're not tied hand in hand.	***Leibbert*** (69/5) Well, what we have is the culmination of all of this work up into about this point. We know enough about what's going on over here to know where to put monitoring wells. Those locations are subject to input from the other agencies.
69/11	Moorer	Mr. Marquess, do you agree with that? Do you agree that there's enough information now that's been provided to you and to DEQ to be confident that where those 100 monitoring wells are going to go, you know will be put in the right place or an optimum place to accomplish the purpose?	Scott Marquess	Well, there is no right answer to develop -- you know, you're not going to have a single right answer about what the monitoring program has to look like or where a well has to be. So, yes, we can site monitoring wells based on information that's available and in hand. I don't think the need for an updated or revised groundwater model is essential to be able to adequately site the wells that we -- that are planned at, you know, the end of the year for the southern and eastern boundaries of the plume.	
70/4	Moorer	Does DEQ agree with you know?	Marquess	We have not discussed that.	
70/8	Moorer	With DEQ, DEQ has not weighed in on that?	Marquess	We haven't had any discussions about that in any recent time frame	
72/24	Gerald Verduska	Don't spend a lot of time on this because maybe most people in the room know the answer to this question, but I'm trying to understand this Platte River conductance a	Leibbert	When we talk about riverbed conductance, just for a minute, what we're talking about is if there's a pumping influence outside of the river, like MUD's well fields or anyone else's,	

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		little better. Does the MUD model show relative mirroring of the upper level of the aquifer; do the water in those respond to level in the Platte River; in other words, if the Platte River goes up and it go down a couple feet, do those wells, the upper level of the water goes down a couple feet, does it mirror? And if it does, how about the contaminated area, the plume zone, does that level mirror the wells and the river too?		the question that the model is trying to answer is when this well pumps, you know, let's just say a lot, when it pumps a lot of water, how much of that water comes out of the river versus how much of that water comes out of the aquifer that that well actually sits in, and the model has a way to estimate that, and it's this conductance factor. And, again, we have some real world information available to us to help simulate that in the model, but there's not a great deal of information available, and, again, that's – as Scott pointed out, that's one of the things that needs to be done in the future is to better estimate that. So as this well or any one of these wells, as this well pumps, a certain amount of that water comes out of the river and a certain amount of it comes out of the formation. Well, I shouldn't speak about the MUD model because it's not mine, you know. I can't really tell you what it does or doesn't say about this specific question; I'll just talk in general. In general, you would think the answer would be yes, that when there's lower flows in the Platte River, whether it's a drought or any – for whatever reason, if there's a smaller amount of water in the Platte River, that the percentage that comes from the Platte goes down in this well, and this well picks up more water from the aquifer and less from the river. And vice versa, if the Platte River is very high, whether it be a flood or whatever it has much more water than normal, it would show up in this well as well.	

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75/2	Verduska	So what I'm getting at is from a layperson's point of view maybe it's oversimplification, but if you saw the river go down two feet and within a relatively short amount of time the water in those wells went down two feet, you would probably assume there's a lot of conductance between the two. And I was just wondering, does the model show that?	Leibbert	Right. I don't know, because it's not mine, I don't know what it says exactly, but it should -- that should be a true statement the way you described it, is that when the river goes down the water level in here should go down. The only exception to that would be you may not really see a drop in the water level here because it'll get more from the aquifer to make up the difference. So the water level in the river may drop dramatically in a short amount of time, but in the well over here the water level may stay steady because more of it is coming from the aquifer and not from the river.	
76/2	Verduska	Well, that's what I was getting at, it seems like that's one of the most important things of the modeling; if you see the plume varying according to the rest of the aquifer in those wells, it shows a great conductance between the whole works. And like the water level in the plume, what elevation above sea level is that compared to the elevation in the wells, do you know that? Seems like that'd be a real important number because you'd know if it's a uniform, if it's connected to the aquifer.	Leibbert	I don't have a number. I can't tell you what the elevation is, but -- Sure, we have water levels for all these wells. I just -- I can't tell you what they are because there's 300 and some odd wells, but you're on the right track in that – and this is what the Saunders County consultant talked a lot about in his comments, was the reason why this riverbed conductance is so important is if these wells in the Platte West Well Fields, if they get most of their water from the river then that means they'll have less of an effect on us. If they're not getting a lot of water from the river, and they're really getting a lot of water from the formation, then that means they'll have a stronger effect on us, and that's why that's an important perimeter, and that's why he had it in his comments, that's	

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				why MUD's acknowledged that in their Phase 2 report, you know, that's why there's a need for more work.	
79/17	Moorer	Do you -- can you tell us roughly for a sense of comparison in your RDGM 4, roughly how many irrigation wells did you use on that one, and then did you add more when you did your partial update in 2005? Do you have a rough idea of what the total pumpage was and for how many months?	Leibbert	I don't know the number of irrigation wells. Without looking at it I think, you know, when we simulate it, we pump them for two or three months out of the year just like a normal irrigation season would be, and the total combined pumpage again, I don't know the number off the top of my head without looking it up.	
81/12	Moorer	At the February 22nd, 2005, RAB meeting, Richard McCollum stated, people who are expert in the field have reviewed our site model and have determined it to be adequate. I'm wondering who are the people who are expert in the field who have reviewed it and determined it to be adequate?	Leibbert	Well, I can tell you all the reviewers, but I can't tell you their opinion, whether or not it's adequate, but Dr. Brian Zurbuchen reviewed it, EPA reviewed it, the Corps of Engineers Center of Expertise for Hazardous and Toxic Waste reviewed it, and I think that's it during the development.	•
82/2	Moorer	My question is specific; that is, who is the -- who are -- is or are these experts that Mr. McCollum was referring to who have deemed it to be adequate? Clearly I would think a fair characterization of Dr. Zurbucken's comment is that he did not find it adequate, nor did Mr. Marquess's comments in April of 2004 find them adequate, so what expert in the field is the one that Mr. McCollum is saying has found your site model to be adequate?	Leibbert	Yeah, I don't have an answer for that, I don't know.	The following agencies have reviewed the USACE Kansas City groundwater model for Mead: • EPA, to include their Ground Water and Ecosystems Restoration Division in Ada, Oklahoma • NDEQ Corps of Engineers Environmental Center

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					of Expertise These agencies all reviewed the model at some point during its continuous development. Comments received from these agencies are incorporated into the subsequent iteration of the model. Comments are generally suggestions on how to improve the model or what new data should be included.
82/15	Moorer	All right. Will you please follow up on that, and so then as part of that would you then determine when were -- tell us when these reviews occurred and where these reviews were published -- the ones that found your site model to be adequate as of February 22nd, 2005?	Leibbert	Well, you've got a lot of the comments from DEQ and EPA.	Leibbert (83/8)The model is adequate; however, the model can be improved in ways, and, again, this is what we talk about, this is what Greg talked about, modeling is an iterative process. There is no stopping point in the process, there is no end point where you say this model is adequate or this model is not adequate. You go

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					through this continuous improvement process and you look at the model, you collect measurements from the real world, you take real world water level data, you take real precipitation rates, you take real irrigation pumping rates, and you put that into the model and you see how good a job the model does in matching those. So it's -- you know, is the model adequate or not, yes the model is adequate. Do we need – is there more work to be done on the model, yes, there's more work to be done on the model. Every year when we get new information it's our job to put that back into the model and verify if the model is still doing a good job or not. It's this cycle of continuous

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					improvement there is never really a stopping point for the model.
84/10	Moorer	Mr. McCollum also stated at that February 22nd, 2005, RAB meeting, he said, there's a possibility of having further peer review of it just to make certain we haven't missed something. We talked about the possibility of asking the USGS, perhaps in a location you know, kind of not here, you know, that hasn't been involved; in other words, to get some totally fresh eyes on it. We're looking at that because we do hear your concerns. We want to make sure we have as good a model as we can. So that's the end of the quote from Mr. McCollum. Whose totally fresh eyes has the Corps gotten to review its site model?	Leibbert	We have not gone for any sort of outside peer review other than the EPA and NDEQ at this point.	
85/3	Wanda Blasnitz	I guess I was wondering because you had said that this is a numerical model, and Mr. Steele had indicated that the analytical model is a better model, and I think you said too that numerical models are not that good at predicting where the contaminant will go and how fast it will go, so have you thought about going to an analytical model?	Leibbert	I may enlist Greg to help me. Greg also described the analytical modeling in that it's very simplistic, and the only way you can get the analytical model to work is by making a number of assumptions that decrease the complexity of the problem you're trying to model. Their -- analytical models are better in the sense that they can be easier to use and they can be more simple and it doesn't require as much work, but analytical models have -- they're only capable of doing ce that's this large and this complicated, we have to go above and beyond what the analytical models	Steele (88/25) Yes, you had mentioned that I had said that analytical models were better than numerical models, and it really depends on the situation. The analytical models are very useful tools, but it's the situation that you need. They're really good for the simplistic aquifers,

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				can do, and that's what the computer numerical modeling does, is You know, Greg had a number of different equations, and if you're doing a very simple problem maybe you only need to do that equation once, but if you're doing a problem like this, you need to do that same equation hundreds of thousands of times, and that's what the computer does, is automates all those equations and arrives at a numerical solution that way. It's -- I'm not so sure it's a case of one is better than the other; it's that analytical models have their place and are good for some things but not everything. Numerical models have their place and they're good for some things, but they're not good for everything, and we're in the situation that we need a numerical model, a computer model to do something that's as complicated as this, so that's the first part. The second part about -- the model has a hard time predicting the total cleanup time, and it really goes to what mechanisms govern the spread of contamination, and based on the operational history of the site, based on the information that we get from our sampling, you know, you can say that contamination was released up here, and then over the course of 40 or 50 years it's traveled in this direction.	but as far as better than numerical models, that's not the case at all.

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				The groundwater model, the RDGM 4, which is a numerical model, does a very good job of predicting this direction, and it does a very good job of predicting how fast it's going to get there. But what it doesn't yet take into account is all the other mechanisms that affect the contamination, and probably the easiest way to describe this is a contaminant like TCE, is -- it's an organic compound, and it likes to attract or stick to other organic things in the aquifer. So soil has a lot of natural organic material in it, that's what makes it good for agricultural purposes because it has a lot of organics. The TCE will -- when it's in the groundwater and it's moving through the aquifer, it likes to grab ahold of those other organic materials in the soil and just kind of stays there. The water continues to move, but the TCE gets hung up and doesn't move as fast as the water does, and that's -- that's kind of an oversimplification. That's another – another aspect of the model, and Greg had this in his slide when he talked about you kind of start with the mod flow code and you do your hydraulic, you do your groundwater model for flow and directions and velocities and things. And then the next step is you go kind of above and beyond that, and you do contaminant transport, you do -- I can't remember what else Greg had in his slide, heat and surface flow and other things. Those are kind of the next level. You know,	

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				after you -- you've done your groundwater model, you go to the next step and you do contaminant fate and transport models.	
89/10	John Knapp	And the question is pretty general. If you make an assumption, for instance you're talking about the well -- the irrigation wells, and so, I mean, in the real world the water is going someplace, and if you've made a mistake in your -- say, for instance, you assume the wells pump at their rated capacity when they were drilled and they're only being pumped, say, actually at 60 percent or something like that, how does this get squared away on a model as -- and not -- you know, you're -- this water -- you're picking up this water someplace else, and so how do you get these things back in the same --	Leibbert	It's called the water balance, and the question is exactly the way you posed it; where does the water go and where does it come from? Water comes from the up gradient direction at -- here at this site it basically moves in this direction, so water that's down here today used to be up here at some point in the past, so water flows this direction. Water also comes from precipitation, and then the other way water gets into the formation is through irrigation, you know, you irrigate, you pump water out of the ground, you spray it back onto the ground, and a certain percentage of that water percolates down into the ground; some of it evaporates, some of it percolates down. We're never going to know the exact pumping rate for every single irrigation well because every person out here that -- that farms and has an irrigation well does it according to his or her schedule. You know, we don't know how much they pump, when they pump them, we don't know how often they turn them on. We know in general, you know, they're a three-day on/five-day off cycle or some other cycle that each individual farmer, you know, decides himself. But what we can do is we can make some estimates. You know, in general, we know what the average is; three days on/five days off for an average of two	

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				months out of the year or maybe two and a half months out of the year. The flow rate is a little trickier to estimate because somebody may put their irrigation well at a thousand gallons per minute, and someone else may pump their irrigation well at only 200 gallons a minute, and where's the average in between that, sometimes that's hard to determine when there's -- when there's so many irrigation wells. So the way we do that is we -- we make our estimate and we put that into the model and then we run the model, then see what kind of predictions it makes, and then as Greg described, it's called the calibration process, the model tells us -- the model basically says I think the water level at this location should be, you know, 57.8 feet above sea level, and we go out and we actually collect a measurement, and it's 59 feet above sea level, so it's different by a small amount. Some amount of difference is acceptable as long as it's very small and it's very -- it's very orderly. As long as there's no random fluctuations that go all over the place, some amount of difference is okay. And there is kind of a -- there are some limits that -- you know, the academic and the modeling community have defined for what -- what is and is not an acceptable range. We work with the model and we try to collect enough information from the real world to try to make that difference as small as we can get it. Is it a hundred percent perfect match for every single well out here,	

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				no, it's not going to be a hundred percent perfect match, but it is going to be within the acceptable limits, and if it's not, that means we have more work to do, and we need to go through that process again and take more measurements and refine the model to make it better. So it's kind of an ongoing, continuous process that you're also trying to get closer, you're trying to make that difference as small as it can be.	
93/1	Moorer	Did you have the answer for me then on the irrigation wells on the RDGM 4, both the number and the rate or the pumpage?	Leibbert	Well, I think Table 4-1 shows that there's 57 supply wells in the modeled area. And it has an approximate rate for each one of them, and the combined total is not shown. So you can add them all up. Table 4-1 has all the pumping rates for those wells.	
93/17	Moorer	So you only looked at 57 irrigation wells for your RDGM 4.	Leibbert	Yes. Because the RDGM model is very small and it's really only focused on this site in our extraction system. We're not trying to model all of Saunders County, we're not trying to model everything that MUD is trying to do in their model. You know, you probably know MUD has hundreds, and there's some controversy about how well they describe that in their document, the number of irrigation wells that they have in there, but they have hundreds because their model is probably ten times the size of our model. When we do the next version this year, 2006, again, all the comments from DEQ and EPA, we're to make the RDGM model bigger	FOLLOW UP

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				to include more of these things, and that's what we're going to do, that's actually already started.	
94/15	Moorer	So when specifically are you going to produce the update of the RDGM this year, precisely when, like what month?	Leibbert	I think the schedule says that we give a document to EPA in September of this year.	FOLLOW UP
94/21	Moorer	And it'll be published at that time? What's the cutoff for the data then that you're going to be plugging into that? What is the cutoff for the data that you will be plugging into that? (95/6) What would be the last possible date at -- in which or at which -- on which you could plug in more updated information in order to come up with your September RDGM 5, is that what you would call it?	Leibbert	I think to try to answer the intent of the question, I think for this March and this April we're doing all this investigation work here, and part of that is to collect water levels from all of the monitoring wells, and that -- we do that ourselves. We coordinate that with the NRD because they have a number of wells in their area that they take measurements at. I can't remember if USGS does that, so us, NRD, USGS, MUD is probably going to take water levels from their wells. So next Wednesday we'll get water levels from all these wells in the whole area. It -- that is going to be the calibration target that URS is going to use in this new version of the RDGM model. They're going to -- and when we talk about calibration, basically we -- you know, next Wednesday we're going to take water level measurements from all these wells, and then URS is going to use that as their calibration target for the model. So they're going to run the model with new conductivity information and new riverbed estimates and those kinds of things to see if it can match those water levels that we collect on next Wednesday.	Larry Angle (96/6) City of Lincoln. And the university also has a couple.

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				So in a sense, maybe that's the cutoff time that you're thinking of. You know, we have new information from last year, new information from 2004 that hasn't been incorporated, so it's basically everything up to this point, and the water level survey next week is one of the key calibration targets that'll be used. So between March and September is when URS and we kind of, you know, go to the computer and do the work and write the report and, you know, we review the report internally before we submit it to anyone else, and those kinds of things	
106/8	Moorer	Are you satisfied then with what they [MUD] did in the -- in the 2005 model on that issue? [evaluate average pumping rates higher than the permanent rate-- response was that they would do simulations at higher pumping rates]	Leibbert	We've provided comments to them on the '05 model, and we have no further comment on this question. We are satisfied.	
106/20	Loris Lutkenhaus	When they're permitted to pump 104 million gallons a day why would you even consider letting them only give you information for a water model that's 70 million gallons a day?	Leibbert	Well, we need to be more specific. They're not allowed to pump at 104 million gallons per day uncontrolled. There's an annual average rate of 52 million gallons per day, that that's what the permit is meant to enforce. And the model -- the '05 -- the '04 and '05 modeling report did look at pumping rates higher than the 52 MGD permitted rate.	
107/8	Lutkenhaus	I think if you read the 404 permit it says they can pump at 104 gallons a day. Now, you're right, the average pumping rate will be 52 million gallons a day to fulfill their maximum pumping, but they can pump at 104 million gallons a day for however many days they want to pump.	Leibbert	I can tell you that everybody knows that during the summer they're going to have to pump more than 52 MGD to fulfill the demands, and then during the off-peak seasons, during the wintertime, they'll have to pump less than 52 MGD so that by the end of the year their annual average is only 52 MGD.	

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109/22	Moorer	Mr. Leibbert, just if -- it's possible that people are not clearly just to say they need some more work on it; is it not accurate to say that for the second year in a row MUD did not use actual pumping rates for the City of Lincoln? They did not use accurate pumping rates for the City of Lincoln in this second model; that is their 2005 model, so much of the same -- many of the same deficiencies were repeated in the second model with respect to the City of Lincoln pumping rates.	Scott Marquess	I believe on -- we had a similar comment. I think the issue in the second model was that it wasn't the current use, it was a projected future use, which is reported on Lincoln's web site. The City of Lincoln has a web site that has some master planning, and so I'd like – our comment was to the effect that you need to consider the projected future water use, needs, whatever of the City of Lincoln as outlined in their master plan, which I don't think they did in the second model.	
111/8	Lutkenhaus	On MUD's second model did they use any information from the 1997, information that they used for the first model, did that make sense? Did they use any of the same information on this second model that they used on the first model? … one would be the Lincoln water system, of their usage. I mean, they estimated it for the first model; did they estimate for the second model?	Leibbert	Well, I think it's similar to Lynn's question is are they using actual pumping rates from the City of Lincoln. I think the answer is no, they're probably not using actual pumping rates; they're using something else that they've got from another source, which was kind of their future expansion. That's something that can be changed the next time they do the modeling.	
112/7	Lutkenhaus	On the 404 permit, No. 60C, permittee -- solely at permittee cost will provide a base line transient groundwater model using the most current data available. So they did not do that, correct, just by what you said? So they're in violation -- technically they're in violation of the 404 permit?	Anderson	We're not prepared to talk about specifics of the permit tonight. I will refer you to the MUD web site, which posts its current permit status, and that's been vetted by the Corps of Engineers, the permit conditions and the status. So the only -- the bottom line is on the permit that us and Omaha are in concert with is that the -- that MUD will be in full compliance with the permit before they begin operations. It's not a, you know, in violation at a particular time, but by the time they are	MUD is responsible for installation of additional monitoring wells to *"...detect any influence the pumping of the Platte West Wellfield may have on either the Mead Site groundwater baseline or the remediation efforts at the Site."*

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				ready for full scale operations they'll be in compliance with the permit.	[quoted from Permit condition 61(b)]. These wells will be solely at MUD's cost, and in addition to MUD's existing monitoring well network. Additional monitoring wells are required to be installed by KC Corps to actively monitor the plume under the OU2 ROD, irrespective of MUD operations. The specific number of monitoring wells needed for the monitoring network has not yet been determined, but the KC Corps has been provided funding to install a large number of monitoring wells for multiple purposes at the NOP site. Some of these monitoring wells will be located east of the plume and some wells will monitor

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					groundwater south of the plume/extraction well network. A detailed monitoring program to evaluate performance of the NOP containment system will be developed by the KC Corps subject to the FFA/OU2 ROD and EPA/NDEQ approval. The location of the monitoring wells installed by MUD will also be incorporated into planning this comprehensive well network to ensure the best configuration possible to detect any hydraulic influence or impact before it would reach a magnitude that might actually influence plume movement. See MUD website ***http://www.mudomaha.com/plattewest/documents/contents.html***
113/9	Moorer	Would you explain what you mean by vetted? Was this -- the status list composed	Anderson	The status is written by the MUD and it's reviewed by Omaha District before it's posted	

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		by MUD and then Omaha District signed off on it or was it an Omaha District generated project?		on the MUD web site.	
114/14	Moorer	You said you're basically satisfied with what MUD said in their 2005 model regarding Johnson Creek and the flow?	Leibbert	Regarding the ability of the model to simulate vertical flow directions, yes, we're satisfied with that.	
115/14	Moorer	Mr. Leibbert, do you have a document that shows the resolution of each of these? Mr. McCollum mentioned to us at the February 2005 meeting normally when we resolve comments there's some statement as to what the resolution is. So is there some document that is – that we could look or that you could provide us that shows what the resolution of all of your comments were on the 2004 model?	Leibbert	I'm reading from the responses that MUD wrote to all these comments, and then giving the Kansas City position on those. There is no memorializing document the way you're describing it, no. I have all the responses that MUD wrote and I have all the comments that we gave them on the 2005 model, and pretty soon we'll have responses to those comments as well. And you asked for the Kansas City opinion on those responses, and that's what we're talking about here, this is what I'm reading to you.	
118/3	Mike Ryan	You were talking about you're only requiring MUD to work their model assuming a 70 million-gallon a day pumping rate; is that correct?	Leibbert	No, not exactly. We're not requiring them to do 70 or 75 or 72 or 83; there's no requirement like that, no.	
118/13	Ryan	You're suggesting it?	Leibbert	Well, we asked them to evaluate what would happen in this -- what would happen to this site, what would happen to this project, what would happen if you did pumping rates higher than 52 million gallons per day for longer than just a couple months out of the year, because we know they're going to go above 52 MGDs at certain points of the year. So what if, it's kind of a pretend question, it's something we asked them to do some of these what-if scenarios, and they did that in	

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				the 2005 version of the model.	
119/9	Ryan	How high did it go?	Leibbert	They went up to 104. And I think it was 5 MGD increments; they started at 52 and I think they went 5 and then 5 more, so probably 57, 62, 67. I think they did it in 5 to try to demonstrate or try to illustrate rather what would happen at all those different steps, at 57, at 62, at 67, and their conclusions are in those -- in their report.	Marquess (119/22): I'm not sure if they did 5 MGD increments, but they went to 104.
119/24	Harold Kolb	For how long?	Marquess	MUD's model has 104 MGD scenario under steady state, and they did what they called particle tracking, where they placed a particle east of where the plume boundary was alleged to be, and saw that how that behaved. I don't have a problem with their depiction of the plume boundary, and what they did was I think the particle tracking was – the particle started at a half mile east of the plume.	
121/18	Moorer	Mr. Leibbert, on that comment though you also had in there in 2004 the -- your view that there are many residential water supply wells and irrigation wells located east of the plume boundary, and the model must be able to demonstrate these wells are not -- will not be impacted, and as a result of the well field -- Platte west well field pumping. In the 2005 model they didn't include residential wells yet again, so do you want to revise your answer, you were satisfied that – with what they did, because they, again, this time around, did not include residential well pumping in their model?	Leibbert	Residential well pumping in the model is insignificant. It doesn't – the model doesn't need to account for pumping from residential wells. The -- just to the comment more as to illustrate where those residential wells lie, and they're not -- there isn't a figure in the report that has residential supply wells? They do everything except that one? Well, we could ask MUD to go back and do that again to show where all the residential wells are, maybe that's something we can amend our comments to.	KC Corps and MUD each have the responsibility to install separate but complementary groundwater monitoring networks. Under the FFA, KC Corps is required to monitor the plume containment necessary to evaluate the performance of the remedy. This includes monitoring

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					potential plume movement regardless of the cause. Given this, KC Corps will install a network of monitoring wells along the eastern (and southern) edges of the plume by Fall 2006. Sampling from these wells will provide both chemical and hydraulic data to determine if the plume has moved from its baseline. MUD is responsible for installation of additional monitoring wells to *"...detect any influence the pumping of the Platte West Wellfield may have on either the Mead Site groundwater baseline or the remediation efforts at the Site."* [quoted from Permit condition 61(b)]. MUD has proposed the use of hydraulic monitoring wells together with

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					predictive groundwater modeling to provide a warning of conditions that may lead to impacts to the plume or NOP operations. These impacts would be known prior to any actual movement so that modifications in wellfield pumping can be made proactively and the impact avoided. Sampling will be conducted by KC Corps and MUD at the same time to ensure data is comparable. Data from both well networks will be shared among all agencies. See Permit condition 61(b).
123/19	Moorer	Just to clarify because you had said just a few minutes ago we were satisfied with what they did, and at least with respect to residential wells, I want to make sure that's what you really meant.	Leibbert	Well, we agree with the comments that Harold had in his letters as well.	

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124/1	Gerald Verduska	What month of the year was it when those particles were put into the ground east of the plume to see what kind of movement, if there was any, do you remember what time of year it was?	Leibbert	It's not really tied to as a specific month or a specific time of the year, but the way this simulation works in the model is it's kind of a what-if sort of question, a pretend. And the scenario is pretend you can see one molecule of water, and as that one molecule of water moves over time you can -- you can watch it, you can see where it goes, every -- every step it makes you can see where it goes. So the simulations, you know, that MUD did with particle tracking is you put a particle up here and then you turn the model on and you say, model, assume you're going to pump at 52 million gallons a day all day every day all year long for the rest of time, for infinity; where would that particle go. And then the model does its calculations, and it makes its predicted path and it shows where that particle goes and it also shows how fast it travels. So in the 2005 report that MUD did, they put particles up here and then they went -- I'm not sure if it was exactly one-half mile, but they went about a half mile here, and then they did particles again, and then they said, you know, if this pumps at 52 million gallons a day where does that particle go, and then they said if this pumps at some other rate higher than 52, and I think they went all the way up to 104, where does that particle go. And some of the simulations show that the particles go this direction or they go and then they come back around like this, you know, and it can take, you know, 10, 15, 20, 50	

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				years for it to travel that way; that's what the particle tracking And I don't have it right in front of me, the conclusions were basically that the only time they could -- they could make a particle come all the way over here was if they pumped at 104 million gallons a day all day every day all year long every year from now until the cows come home.	
125/25	Verduska	It seems like that would be an almost impossible calculation to do unless you knewthe conductivity with the river.	Leibbert	Well, the riverbed conductance, the hydraulic conductivity, the storativity, the transmissivity, the precipitated, all those things factor into those calculations. So as long as we're talking about it, this is what we talk about when we talk about sensitivity analysis for the model, and that basically says we tell the model, use this value for hydraulic conductivity, use this value for transmissivity, use this value for riverbed conductance, and then do the calculations and see what you get. And then for the sensitivity analysis you say, well, what if I leave everything else the same but I change this one parameter, if I change the conductivity to something else then what happens, do I get the same results, do I get different results, do I get drastically different results or do I get different results that are only small. And that's how you would evaluate how sensitive the model is to those kinds of changes. The riverbed conductance is definitely an important factor. If you make some sort of	

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				guess about this factor, and you get a result that says this particle goes from here to here in ten years	
127/4	Verduska	But what you're saying is that under the worst case scenario the highest conductivity the particle didn't move at all when you started out east of the plume? When you started out at a half mile east of the plume in the worst case scenario it didn't move at all?	Leibbert	I don't think that's what they did exactly. They -- what they did when they did their particle track analysis they were using the -- the calibrated version of the model, which is basically what they think is the best version. You know, if they think they have a good value for the riverbed, they think they have a good value for conductivity, they think they have a good value for recharge, and they think that's a good match because they did the calibration process when they showed that the difference in water levels is small, that it's within acceptable ranges. So starting with that, what they think is kind of the -- the best version, then they did those particle analysis -- those particle tracks, and they went all the way up to 104. It's all in the report.	
128/5	Verduska	Did they -- in the model did they have a figure for an August -- the amount of gallons that comes down the valley per day? Surface water and aquifer movement down the valley?	Leibbert	Well, it -- I'm not sure, I don't know if they had -- I don't know if they gave something specific like that for August of a certain year.	Marquess (128/17) I believe -- I don't believe there was a specific to a month, but it's got to be -- it's not just a monthly thing. It's got to be over some period of time that you'll get some representative output from the model I guess; would that be an adequate way to describe it? So, no,

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					there's not an August. There'd be lots of Augusts that we'd have to look at, so we'd have to have somewhat of a steady state or even a transient over some period of time.
129/2	Verduska	The reason I chose August I was -- I think it's prudent to always take the worst case scenario.	Marquess	Right, they do have some high stress conditions that they do model.	Leibbert (129/7) Yeah, that's what I wanted to say as well. It's a little -- it's a little hard to explain, and it's a question really better posed to MUD because, you know, they can explain what they did better than I can explain what they did. But to try to account for worst case things they used stage data from the river, like the lowest point. You know, they -- in some ways they tried to account for those worst case scenarios. They -- I can't say that they used the worst case scenario for every single parameter every

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					single time, but there's different points in the model where they did account for drought conditions, low stage levels in the river, I'm trying to think, low precipitation amounts so therefore you get less recharge which means more water has to come out of the aquifer. So I don't think they did something specific the way -- the way you described it, but they do account for worst case scenarios in some cases, yeah.
130/6	Moorer	Wouldn't it make sense for the purposes of what everybody wants to know about this area, that at least one year, if not maybe a couple years, in a row that they calibrate -- MUD calibrates its model to August rather than doing it to March or October? I mean, in order to address what Mr. Verduska is talking about basically, to be to able to say this is -- these are the data that we have gathered from all of these different places that we've checked them on March or checked in them in August -- in October and say, here we are for August. Let's calibrate it to here for now so we	Marquess	Yeah, I'd say that is a reasonable suggestion.	

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		have a better read on what it's like after a couple of months of heavy irrigation pumping.			
130/3	Moorer	Yes, it is reasonable; could you make that suggestion to them, or directive?	Marquess	I cannot make directives to MUD. We make comments, suggestions; we are not -- we do not regulate MUD under the permit. Can you make that suggestion, yes, we can.	
131/10	Debbie Crane	I just have a question. I've been coming with Scott to these meetings for about a year and a half now, have -- has MUD been invited to these meetings and they've refused or why do they not come?	Marquess	MUD was here -- no, MUD has never been here. I don't believe MUD has ever been at a RAB meeting. The Omaha District was here one time and then elected not to attend further.	Anderson (132/9) I do believe they have had some other public forums regarding the model. Anderson (132/24) And as Jason pointed out, we're not here to explain MUD. We're here to offer our review comments of the model
135/16	Moorer	If you could just summarize what they did and why that was inadequate. I mean, they used less than half of the registered irrigation wells within Douglas, Sarpy and Saunders County that are registered with DNR, they used only about 550 irrigation wells even though they had said we will use all of the registered irrigation wells for 2005; that's one of the problems, is that not true?		Well, if you say so. I mean, they used half the wells, they used this number of wells, they used that number of wells; I mean, you know the facts, you know, you tell us. I think the comment that you guys made in your letter is a good comment, and you pointed out some of these inconsistencies, and it's not really clear how many wells are in Sarpy County versus how many are in Saunders County and how many wells are active in the model and how many wells are not active in the model, that they need to do a better job of explaining that, and that's why I think you made that comment. So, you know, it's incumbent on	

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				them to provide the response to that. It's not incumbent on me to speculate how MUD may or may not respond to that comment.	
143/16	Verduska	I was curious whether the model takes into account that Western Sarpy dike on the other side of the river, because I think -- I think they probably should if it doesn't because I think most hydrologists would agree that because the river is going to be confined and narrower and the velocity is going to increase and very likely the river will degrade deeper into the ground which could possibly impact the conductivities severely if it's a lower elevation from now on. Just on the other side of the Platte from the well fields, and then going to the south.	Leibbert	Yeah, well that's a -- you know, the geometry or the way you described it, if the river is confined it's going to react differently, that's -- I can't say for certainty if that is or isn't in the 2005 MUD model.	
144/14	Verduska	You know, with the – since the Missouri has been channelized, it's degrading into the ground, and the Platte is degrading to match it, but it'll degrade faster with the velocity being increased during higher storm water flows.		The Missouri has been channelized, it's degrading into the ground, and the Platte is degrading to match it, but it'll degrade faster with the velocity being increased during higher storm water flows.	
148/14	Harold Kolb	So will you stop the pumping if the plume moves? Will you tell these guys to tell Omaha to stop the pumping because you're contaminating -- they all worry about MUD's wells, what about the 500 people or thousand or whatever that live between where that pretty little line is now, and the east; don't they count?	Marquess	The intent of this operation, the OU2 ROD says thou shalt not allow the extent of this containment to expand basically beyond what it is right now, and that's the criteria that we intend to ensure is enforced.	
149/1	Kolb	So we have the EPA's word on it that it will not go east of that, and if it is, whoever	Marquess	That's the intent, yes. The plume is not supposed to move east, south, north, west,	

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		causes it, will stop it from going east?		anywhere beyond from where it is right now. That's the ROD -- that's what the record of decision says.	
149/9	Kolb	And in five years after they start pumping, if that plume is moving a whole lot more than your pretty little computers show – your little computers here say, you will make them stop pumping?	Marquess	We'll have to see why it's -- you know, what's happening, why is it happening? Has the containment system failed, is there plume past to the south. There could be any number of causes that would -- that may impact the plume to expand. Well, if there's plume movement to east then we'll have to take steps to address it.	Under the Permit, the development of "triggers" for corrective actions and a specific Contingency Plan has not yet been completed, and specific responses cannot be provided at this time. It is envisioned that a process which solicits input by all Federal, State and local agencies will be used in the development of the Contingency Plan. Under the FFA/OU2 ROD, in the event of plume movement as a result of MUD operations, EPA's initial response will be to ensure the KC Corps takes the necessary additional actions to regain hydraulic containment pursuant to its existing

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					responsibility under the FFA and OU2 ROD. To that end, EPA, NDEQ, and the KC Corps are actively working on finalizing the Containment Evaluation Work Plan, which is a critical document not only in assessing the KC Corps' compliance with the FFA and OU2 ROD, but in determining the response to any adverse impact to the plume. This work plan is expected to be complete by the end of 2006. In addition, EPA will remain actively involved in keeping abreast of MUD's activities required by the permit. It is EPA's expectation that the Omaha Corps will be active in immediately and aggressively enforcing the permit conditions. See Permit Condition

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					62(e).
150/9	Kolb	When this next groundwater model comes out as of -- I mean, MUD is supposed to put one out, what, every six months after they start going and every year until they start pumping if I remember right, and you guys are going to have a groundwater model out in September -- or later this year we'll say, so that all these concerns that are addressed in here from everybody else will totally be answered; is that -- are you going to answer all of these questions, and I mean, you have from now to September to get all this stuff digested and answered, so will you answer all those?	Leibbert	Well, we're going to address the comments that were directed to us about the work that we've performed to date, and we're going to continue to do this, where we take what the model tells us, check it against what we actually see in the real world, and then decide if that's a good match or not a good match, and then go back and put that information back in the model. So what are we going to do between now and September, we're going to do this cycle, we're going to make our model better by using all the information that's available to us, and addressing the comments that we got in the past. Now, what's MUD going to do every six months or every -- you know, that's not for me to say. If the permit says they have to do something every six months, then I guess they'll do it every six months. I mean, I don't know what they are.	
153/1	John Knapp	My question is kind of back to the – on the -- my initial question was, okay, if -- when you run your model you compare your results on the web -- static level in the wells. So, for instance, right now you're saying in MUD's model they did not use irrigation data and current Lincoln well field data, and so their model if it's -- evidently it's somewhat to your satisfaction, is predicting these levels, okay. This data wasn't in, so now -- now when they come in, when they input this data into the model, that means something else has to give to get this -- this resolved, so which --	Leibbert	A lot of them.	

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		so you got a whole bunch of variables there. You're talking about conductivity, there.			
153/18	Knapp	A lot of them, so how do you know which part of your model -- which one of the other parameters has failed? I mean, if I -- I can change -- if I change the irrigation -- amount of water the irrigation wells are pulling out, that means I can -- I can adjust my conductivity so that this fits, but I could also change my conductivity and something else and it would still fit, so how are you guys deciding which is the real thing that we've guessed -- you've obviously guessed wrong if it's making a prediction without this other data, and so how do you get the right one corrected?	Leibbert	There are a lot of variables, and if you change any one of them, you kind of change the final conclusion, you know, if you change this one, you get a different answer every time you change one of the variables, so that's definitely true. The way a modeler deals with that question is you do a sensitivity analysis, and you look at those variables and you -- you modify those variables one at a time to see what sort of different answers you get from the model, and sometimes, you know, depending on, you know, what you're trying to simulate in your model, the model may be very sensitive to something like conductivity. If you change the conductivity just one little bit you get this big different answer, it makes a huge change in what happens, and then other times the model may not be very sensitive to something. You can change this parameter and it really doesn't change the bottom line, it won't really affect the bottom line, so the reason you do that is to try to home in on what's really gone on in the model, what's really important and what are those critical factors that need to be done just right in order for the model to calibrate well, to get that good match to those static water levels. You know, the practice is that anybody that does a model would go through this kind of analysis, that's just what a good modeler does,	

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				but there's cookbook or there's no recipe that tells you do this, do this, do this, do this, so it's -- there's some subject -- subjectiveness in that process. We did it in our RDGM model, and Dr. Zurbuchen from DEQ gave us a lot of comments about that. He didn't like the way we did it. He had suggestions on how to do it better the next time, so we're going to follow those suggestions. MUD does it in their model. We had comments about that, so it's one of those things that you continue to work on is to try to get those -- all those different variables down to a range that does a good job of matching what you see in the real world. You know, it -- if you change one what happens to the other ones and where do the changes come from, it's a little more complicated than that but you're on the right track, that if you change one variable you can have a greatly different answer in the end if the model is sensitive to that. If the model is not sensitive to that then maybe that basically tells you that either you did a good job of estimating that parameter or it tells you that that perimeter is not as important as these other ones, and that, you know, your time is better spent focusing on those parameters that the model is very sensitive to and have the most effect and can result in the most change when you do that analysis.	

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